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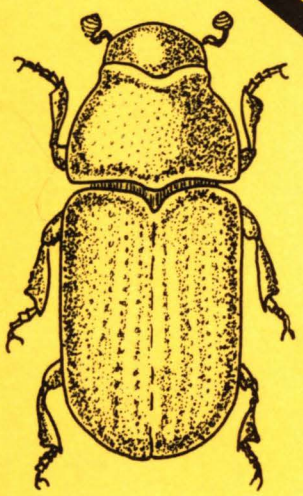
DISEASE DETECTION SURVEY
Air Pollution

Glen Canyon National
Recreation Area
Arizona



Southwestern Region

U. S. DEPARTMENT OF AGRICULTURE

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JAN 25 1977

ROCKY MOUNTAIN STATION

DISEASE DETECTION SURVEY
Air Pollution

Glen Canyon National Recreation Area
Arizona

August 1971

In August 1971, Robert Loomis, plant pathologist in the Forest Service Insect and Disease Branch, examined trees and associated vegetation at Wahweap Campground and Picnic Area, and at Lee's Ferry. This survey is part of the cooperative survey done with Forest Service Region 4. The purpose of the survey was to make note of plant diseases which exist prior to operation of the Navajo Power Generating Plant. The most prevalent problem noted was leaf necrosis caused by heat and drought stress.

Method.--The areas selected for examination were Wahweap Campground and Picnic Area, and Lee's Ferry. The foliage of trees and associated plants were examined for disease and insect injury. In addition, composite foliage samples were taken for each of three tree species located at Wahweap Picnic Area to be analyzed for total sulfur content.

Sample #1 - Elm (Ulmus spp.) composite sample represented equal amounts of foliage taken from five trees located at Wahweap Picnic Area entrance. Foliage was collected irrespective of age.

Sample #2 - Poplar (Populus spp.) composite sample represented equal amounts of foliage taken from five trees located at the north side of Wahweap Picnic Area. Foliage was collected irrespective of age.

Sample #3 - Russian olive (Elaeagnus angustifolia) composite sample represented equal amounts of foliage taken from 16 trees located along the south edge of Wahweap Picnic Area. Foliage was collected irrespective of age.

Results.--Wahweap Campground and Picnic Area - Heat and drought injury was noted throughout. In addition, a soil problem exists in the area, causing chlorosis on several tree species. Trees and shrubs examined include:

Poplar (Populus spp.)
Ash (Fraxinus velutina)

White mulberry (Morus alba)
Honey locust (Gleditsia triacanthos)
Russian olive (Elaeagnus angustifolia)
Arizona cypress (Cupressus arizonica)
Squawbush (Rhus trilobata)
Honeysuckle (Lonicera tatarica)
Tamarisk (Tamarix pentandra)
Sycamore (Platanus wrightii)
Elm (Ulmus spp.)

Leaf necrosis due to drought and/or heat injury was evident on poplar, ash, mulberry, squawbush, and elm. Chlorosis was most evident on ash.

Lee's Ferry - Trees and shrubs examined include:

Willow (Salix spp.)
Cottonwood (Populus fremontii)
Tamarisk (Tamarix gallica)

No significant leaf abnormalities were noted.

Sulfur Analysis Results.--

Sample Number	Percent Sulfur
Sample #1 (Ulmus spp.)	0.13
Sample #2 (Populus spp.)	0.38
Sample #3 (Elaeagnus angustifolia)	0.36

Discussion.--The Navajo Generating Station, located near Page, Arizona, is due to begin initial operation in 1974. The stack effluent of this coal-burning plant will contain a large amount of sulfur dioxide which is a potential hazard to the vegetation in the area. For this reason, background information on current plant condition is being gathered prior to initial operation of the generating station. This information will be important in evaluating any harmful effect the generating station might have on trees and associated plants.

Evaluation of plant injury must include due consideration for the effects caused by the arid climate. Enclosed are temperature and precipitation records, and photographs of injury to vegetation caused by heat and/or drought conditions.

Analyzing foliage for total sulfur content is not in itself a reliable method for determining if vegetation has been injured by sulfur dioxide. Nonetheless, determining current background levels of sulfur in vegetation near the generating station may prove useful in the future task of evaluating any effects on vegetation.

Recommendations.--

1. Conduct a detection survey in late summer or early fall of 1972 in order to gain more information on present vegetation condition.

2. Take additional foliage samples to develop more reliable background levels of total sulfur at Wahweap Picnic Area.

3. Re-establish the sulfation plate stations after the Navajo Generating Station begins operation.

LAKE POWELL WEATHER AND LAKE ELEVATION

(Based on 8 years of records at Wahweap)

	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.
MAXIMUM TEMPERATURE (Degrees Fahrenheit)												
Average	45	53	61	72	82	90	97	94	88	77	59	45
Record	68	72	81	92	97	115	108	106	100	93	74	67
MINIMUM TEMPERATURE (Degrees Fahrenheit)												
Average	24	31	36	46	53	62	71	69	61	50	38	25
Record	- 4	16	22	28	38	47	53	55	36	32	21	3
PRECIPITATION (Inches)												
Average	.16	.30	.37	.36	.51	.13	.24	.79	.72	.33	.34	.53
Record	.45	.62	1.26	1.14	1.89	.33	1.45	1.52	1.31	.82	.98	1.17
LAKE SURFACE WATER TEMPERATURE (Degrees Fahrenheit)												
Wahweap	44	46	55	55	64	72	79	79	73	65	60	50
Bullfrog	47	46	52	54	64	70	76	80	76	69	62	53

WIND

Feb. - May	Strong, all day (24 hours) wind common
June - Mid Sept.	Strong gusty wind and thunder storms - noon to dark, many days. Usually gentle wind or calm night and morning.
Mid Sept. - Feb.	Generally calm all day (24 hours) except when a storm system is in the area.

SURFACE ELEVATION OF LAKE (Feet above sea level at end of month) DAM CLOSED MARCH 13, 1963 - Start of Lake

Year												
1963			3205	3234	3283	3344	3371	3372	3382	3394	3398	3405
1964	3410	3415	3415	3410	3397	3437	3473	3484	3490	3492	3492	3491
1965	3492	3491	3492	3491	3492	3492	3512	3521	3531	3530	3532	3533
1966	3535	3535	3534	3537	3539	3545	3545	3540	3534	3529	3527	3524
1967	3521	3517	3515	3512	3507	3528	3532	3532	3530	3528	3528	3528
1968	3527	3525	3526	3520	3513	3523	3547	3546	3548	3545	3543	3541
1969	3539	3540	3543	3543	3553	3571	3580	3576	3573	3575	3574	3572
1970	3569	3568	3571	3567	3582	3598	3600	3598	3598	3599	3601	3599
1971	3600	3602	3602	3603	3608	3620						

Heat and/or drought injury to sycamore,
Wahweap Campground, August 25, 1971.

Heat and/or drought injury to squawbush,
Wahweap Picnic Area, August 25, 1971.

Chlorosis and heat and/or drought injury to ash, Wahweap Picnic Area, August 25, 1971.

Heat and/or drought injury to poplar, Wahweap Picnic Area, August 25, 1971.

Heat and/or drought injury to elm,
Wahweap Picnic Area, August 25, 1971.

Chlorosis and heat and/or drought injury,
unknown species, Wahweap Picnic Area,
August 25, 1971.